

## MISSION UPDATE



Columbia arrives at Launch Pad 39A on March 11. This view was taken from the Rotating Service Structure.

## STS-83

Columbia (22nd flight)  
83rd Shuttle flight  
Target launch date: April 3,  
2:01 p.m.  
Pad: 39A  
Mission: Microgravity Science Laboratory-1 (MSL-01)  
Duration: 16 days  
Crew: Halsell; Still; Voss; Thomas; Gernhardt; Linteris; Crouch  
Milestones:  
Launch countdown begins March 31.



GOES-K at the Astrotech spacecraft processing facility in Titusville.

## GOES-K

Geostationary Operational Environmental Satellite-K  
Target launch date: April 24  
ELV: Atlas I  
Pad: 36B  
Mission: Next-generation weather satellite.

# Spaceport News

America's gateway to the universe. Leading the world in preparing and launching missions to Earth and beyond.

John F. Kennedy Space Center



COUNTING down to Juno — NASA employee Elisa Artusa helps set up one of two prototype consoles for the Checkout and Launch Control System (CLCS) in the Launch Control Center-X (LCC-X), an experimental control room located in Firing Room 2 of the LCC. The two prototypes are part of Juno, the first CLCS delivery due to be ready March 28. CLCS is being established in six-month increments, with each delivery — named after old rockets — providing a new system capability.

## KSC begins work on LPS successor

A NASA-led effort is under way at Kennedy Space Center to design, develop and implement a new Checkout and Launch Control System (CLCS) for the Space Shuttle with the capability to support future launch vehicles. The first major CLCS milestone will be reached March 28 with the opening of an experimental control room in the Launch Control Center.

Development of CLCS incorporates a progressive and innovative approach that involves the user community to the fullest extent.

"Customer involvement at every phase is crucial to our suc-

cess," KSC Director Roy Bridges observed. "The new Checkout and Launch Control System is a 'must-do-and-deliver' project for us. We cannot support our mission without it."

The CLCS is the successor to the Launch Processing System (LPS). The Shuttle version of the LPS dates back to the early 1970s and is the successor to the LPS developed for the Apollo program. Illustrative of how advanced computer technology has become in the brief time span since the Shuttle LPS become operational is the amount of memory in a single



(See CLCS, Page 4)

## One year and counting on Mir ...

On March 22, the U.S. continuous presence in space reached the one-year mark. On this day a year ago Shannon Lucid lifted off on STS-76, headed for a record stay aboard the Russian Space Station Mir.

Lucid was followed by John Blaha and Jerry Linenger. Mike Foale will succeed Linenger in May, and Wendy Lawrence will succeed him in September.



## MSL-1 a testbed for space station

The Spacelab module flying on the next Space Shuttle mission represents a bridge between past Spacelab flights and the International Space Station.

The Microgravity Science Laboratory-1 (MSL-1) builds on the more than 500 experiments conducted on 30 previous Spacelab flights. MSL uses new and existing facilities to expand upon this research. MSL-1 also will serve as a testbed for new procedures designed to place payloads into orbit in a shorter amount of time than previously possible.

A crew of seven will be on board the Space Shuttle Columbia for the 83rd flight in program history. The five astronauts and two payload specialists will split into two shifts to conduct around-the-clock research during the 16-day mission.

Mission Commander is Jim Halsell. The pilot is Susan Still, who becomes the second Shuttle female pilot (Eileen Collins was the first). Payload commander is Janice Voss. The two mission specialists are Mike Gernhardt and Don Thomas, who is recuperating from a broken ankle and has been cleared to fly. The two payload specialists are Roger Crouch and Greg Linteris.

During STS-83, the Spacelab module will become a real-world testing platform for some of the new hardware and procedures developed for the International Space Station. The Space Station will use different hardware than Spacelab in almost every respect. For example, connections for Spacelab experiment racks are made from the rear.

(See MSL-1, Page 6)

## A musical evening



PORT CANAVERAL Cruise Terminal #10 — A more elegant setting could not have been found for the March 18 concert for KSC employees and their families by the U.S. Coast Guard Band. The 45-member band entertained an audience of about 1,100 with a repertoire that ranged from classical to swing. KSC Safety and Mission Assurance Director Tom Breakfield was on hand to welcome employees.

## Procurement Office welcomes new contract initiatives and improvements

Procurement personnel stepped aside from their routine activities March 19 for a daylong familiarization on initiatives including NASA's Consolidated Contracting Initiative (CCI).

CCI is a NASA-wide effort to streamline the contracting process. CCI goals include meeting users' needs faster; reducing user time spent on acquisition-related tasks and minimizing contract duplication.

Procurement personnel and other invited officials spent the day at the KARS I Conference

Center, learning more about the CCI process as well as other procurement initiatives being implemented by NASA and the federal government, such as performance-based contracting.

Interested personnel can learn more from the CCI Web site: <http://msfcinfo.msfc.nasa.gov/ccifirst.html>

"We want technical personnel to be aware that an item they need to get hold of may already be available through the CCI process," noted Dan Lewis, procurement analyst.

## Jack King, 'Voice of Apollo,' joins USA

Space program veteran Jack King has been named chief of Media Relations for Space Flight Operations Contractor United Space Alliance-Florida Operations.

King is best known as the voice of Gemini and Apollo launch control. He provided launch commentary for some of NASA's most historic launches.

After working at KSC during the 1960s and early 1970s, he moved to the Johnson Space Center where he was director of Public Affairs through 1975.



He worked at the U.S. Energy Research and Development Administration in Washington, D.C., from 1975 until 1977, and then joined Occidental International Corp., also in Washington.

In 1994 King joined the public relations firm of Powell Tate.

At USA, King will be responsible for implementing a media relations program to include news releases and materials, and responses to inquiries and news interviews.

His appointment became effective March 3.

## Beach Cleanup set for April 19 at refuge

The Merritt Island National Wildlife Refuge annual beach cleanup to prepare for turtle nesting activity will be held Saturday, April 19.

The area to be cleaned is a six-mile stretch inside the KSC security zone. Volunteers will meet at 8:30 a.m. at the refuge Visitor Information Center on S.R. 402, four miles east of Titusville, and be taken by bus

to the cleanup site.

Water and trash bags will be provided. Volunteers should wear close-toed shoes and be prepared for about a mile-long walk along the beach. Sunscreen is recommended.

You must be 16 years or older to participate, and it's important to call ahead to sign up. Barbara Bolt is the point of contact, at 861-0667.

## Get ready for the KSC All-American Picnic on April 26 at KARS Park I

Start getting those picnic baskets ready for the annual KSC All-American Picnic, scheduled for Saturday, April 26, from 10 a.m. – 4 p.m. at KARS Park I.

The entrance ticket includes a meal, with the food provided by Fat Boys Barbeque. Refreshments are available throughout the day beginning at 1 p.m.

Ticket sales begin April 14 at all Exchange Stores, the Shuttle Logistics Depot in Cape Canaveral



and the Logistics Building on Contractors Road. Tickets purchased before April 26 cost \$3 for adults and \$2 for children 4-12 years. Children under four are admitted free.

The cost is \$1 higher per ticket if purchased at the gate April 14.

The Logistics Directorate (LO) is sponsoring this year's picnic. Picnic organizers have their own Web site:

<http://www.ksc.nasa.gov/events/1997/picnic/>

Planned activities include:

- Children's games — Pony rides; face-painting; children's rides and games; a petting zoo. Also, a chance to meet a space person, get an astronaut's autograph, see a magic show and rocket launches.

- Sports tournaments — Softball, volleyball, tennis, basketball and a horseshoe tournament.

- Olympic Pentathlon — Features a softball shotput, frisbee discus throw, basketball hoop toss, relay race and tug-of-war for ages 10-15 and 16 and up.

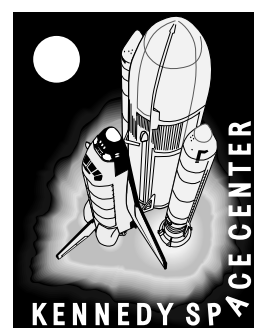
- Entertainment — R&B, blues and Motown, provided by the musical group *Reflections*; alternative and classic rock from *Bravo Hotel*; *Max Q*, the astronaut rock band;

*Community Band of Brevard*; *K.D. Edwards*, a native American presentation; *Trio Arpeggio with Gloria Villalobos*, featuring Latin and international music; and the *Phillipine Performing Arts Company*.

- Dunking booth — Managers from KSC volunteer as easy targets to those with a sharp aim.

- Auto show — New cars, including exhibits by Honda, Nissan, Chevrolet, Ford and Chrysler, will be offered this year. Also on display: classics, antiques, show cars and hot rods; emergency equipment such as a fire truck; motorcycles, a natural-gas vehicle and more.

- Chili Cookoff. Tickets for the popular event are \$1 per person. About 15 booths will offer samples of different chilis.



**TAKE OUR  
DAUGHTER'S  
TO WORK  
DAY**

**APRIL 24 1997**

More details to follow in an upcoming issue!



QASAR Award winners posing with Safety and Mission Assurance Associate Administrator Fred Gregory (second from right) are (from left) Paul Teehan, Marshall Space Flight Center Resident Office/KSC; Russ Marinone, Defense Contract Management Command/KSC; Gregory; and Frank Kiep, Sherikon Space Systems.

## KSC employees nab three of four Best of Best QASAR Awards

Three KSC employees were recently honored as representing the 'best of the best' in quality assurance awareness and continuous improvement initiatives for fiscal year 1996.

The honor was bestowed by NASA Safety and Mission Assurance Associate Administrator Fred Gregory during a recent ceremony in Headquarters. The fourth winner was a Stennis Space Center employee.

The Quality Assurance Special Achievement (QASAR) Award Program is administered by the Safety and Mission Assurance Directorate. The award recognizes government and contractor employees at all centers who have shown exemplary performance in contributing to quality products or services.

The three KSC recipients were:

- Paul Teehan, Marshall Space Flight Center/KSC Resident Office. Teehan was recognized for developing an enhanced Space Shuttle Main Engine quality reporting system which eliminated redundancies and streamlined problem-reporting procedures.

He also developed a technique that will enhance the problem reporting and corrective action processor for main

engines being prepared for Shuttle launches at KSC.

- Russell Marinone, Defense Contract Management Command/KSC. Marinone was cited for his exceptional support after taking over in-plant assurance functions following the sudden loss of a government quality assurance representative at International Fuel Cells, which supplies fuel cells for the Shuttle program.



Marinone also determined a method for ascertaining acceptability of gold-plated fuel cell plates. His expertise avoided major impacts, both cost and delays, to the Shuttle launch schedule.

- Frank Kiep, Sherikon Space Systems. Kiep was recognized for implementing a process for storing critical Shuttle records on CD-ROM disks instead of microfilm.

The new system means need for less storage space, lowered manufacturing costs, reduced processing time, and easier accessibility by the user community. The potential exists for all KSC records to be stored using this more efficient and cost-effective method.

## KARS offers spring specials

KARS is offering KSC employees three special attraction packages this spring. Tickets can be purchased at all Exchange Stores:

- Sea World — From April 1 – 30, KSC employees and their families can purchase Sea World tickets for just \$26 for adults as well as children. Regular admission price for adults is \$40.95.

- Disney Days Special — From April 11 – June 8, ticket prices for employees will be \$27.50, with the price the same for adults and children.

- Wet 'N Wild Day — Saturday, May 24. Tickets will be available through May 23. Price is \$14 per person, ages three years and up. More detailed information will be forthcoming.

## Comet Hale-Bopp Web sites abound

Numerous Web sites are offering special events and features as the Comet Hale-Bopp draws closer to the Sun.

Sporting a nucleus three to four times larger than that of Comet Halley, which is six miles in diameter, Hale-Bopp is one of the largest comets ever observed. The following are a sampling of NASA-sponsored Web activities on Hale-Bopp:

- Hale-Bopp Home Page, sponsored by the Jet Propulsion Laboratory: <http://newproducts.jpl.nasa.gov/comet/>

- Wallops Flight Facility is conducting sound rocket launches to observe the comet in the ultraviolet wavelength. Images will be posted at: <http://www.wff.nasa.gov/~web/comet.html>

- Ulysses Comet Watch page



HALE-BOPP Comet photographed by Bionetics photographer George Shelton shortly before sunrise on March 11.

will feature amateur observers' images of Hale-Bopp at: <http://laspl.colorado.edu/ucw/index.html>

- Hubble images of Hale-Bopp: <http://opposite.stsci.edu/pubinfo/PR/95/41.html>

- Polar spacecraft images: <http://pao.gsfc.nasa.gov/gsfsc/spacesci/pictures/spacepic.htm>

## Loch Ness Manatee?



ANYTHING BUT — Looking quite at ease, a Manatee kicks back in the waters of Banana Creek.

# CLCS . . .

(Continued from Page 1)

LCC firing room minicomputer compared to the average modern home computer. The average new home computer has 16 megabytes of Random Access Memory (RAM)...250 times more than the LCC computer.

The CLCS will feature several major improvements over the LPS, including the capability to monitor more than one orbiter from the same firing room. Incorporation to the fullest extent possible of commercial off-the-shelf hardware and software will reduce system operating costs by 50 percent while making it easier to add upgrades.

The CLCS will be implemented in increments and is scheduled to be fully operational by September 2001. A NASA/contractor team, led by Retha Hart from the Shuttle Processing (PH) Directorate, is developing the system. Serving as deputy for the effort is Ric Hurt from the Engineering Development (DE) Directorate.

Major participating contractors include United Space Alliance (USA), the Space Flight Operations Contractor; I-NET, the Engineering Support Contractor; and Lockheed Martin of the Johnson Space Center-

## CLCS Milestones

- March 1997. Experimental Control Room established.
- September 1997. Support to Super Lightweight tanking test.
- June 1997. System-level specifications baselined.
- September 1997. Console enclosure Critical Design Review (CDR).
- January 1998. Gateway hardware Critical Design Review (CDR).
- May 1998. COTS Preliminary Design Review (PDR).
- August 1998. Software portability demonstrated.
- September 1998. Demonstration of autocommand and control of orbiter powerup.
- March 1999. First operational use of CLCS, Hypergol Maintenance Facility (HMF).
- September 1999. All Orbiter Processing Facility (OPF) application software validated.
- August 2000. First complete CLCS orbiter processing flow begins.
- September 2000. Cargo Integration Test Equipment (CITE) fully operational.
- December 2000. CLCS launch-capable (1st CLCS control room).
- April 2001. 2nd CLCS control room operational.
- September 2001. 3rd CLCS control room and CLCS fully operational.

based Mission Support Contract.

"Because of the importance of the project to the future of KSC," Bridges said, "I have asked the CLCS team to report directly to me."

## Project History

The CLCS was conceived in 1996 by a specially-formed team working under the charter of Shuttle Processing Director Robert Sieck.

One of the constraints on previous efforts to modernize the Shuttle LPS was the requirement to retain the computer language GOAL.

GOAL stands for Ground Operations Aerospace Language (GOAL). It has been in use since

LPS went on-line to support the Shuttle program.

GOAL is a KSC-unique language which has driven checkout and validation requirements due to its design.

A major concern about GOAL was that simple displays are created from the same programs that execute critical commands. As a result, even the simplest of changes require rigorous and exhaustive testing to insure the critical command function remains intact.

The LPS Upgrades Review Team chartered by Sieck concluded that the new launch processing system needed to be free of the constraints imposed by GOAL.

## Features of CLCS

"CLCS is committed to providing a system that allows Shuttle processing to be achieved efficiently, flexibly and at a reduced cost over the current system," said Project Manager Retha Hart. Key capabilities of CLCS are:

- Command and monitor data will be separated. Monitor data can be distributed free of the risk of issuing inadvertent commands.

Launch team members will be able to view data in their office instead of having to go to the control room. (Note: CLCS terminology refers to the firing room as an Operational Control Room, or OCR);

- Multi-orbiter control. More

than one orbiter will be controlled from the same room. With LPS, one firing room is assigned per vehicle per flow. With CLCS, a single control room can be divided into multiple flow zones, each linked to a different orbiter under test. After the vehicle is fully stacked in the Vehicle Assembly Building, one control room will again be assigned to that Shuttle.

- Multidiscipline testing. With CLCS, test engineers will be able to monitor and control multiple systems from the same console. Common functions such as power or cooling system monitoring can be accomplished by a single engineer.

- Consolidated data. Data currently residing on separate computer networks will be integrated into a single data stream available to all CLCS users. For example, weather data from the pad now being stored in the Processing Control Center will be incorporated into CLCS.

- Integrated complex/facility control. Control of facility systems will be combined into the control rooms, instead of being located separately in the Complex Control Center on the 1st floor.

- Local commanding operations. Subsystem testing can be performed locally at the test site with minimal control room support. An engineer with a laptop computer can conduct an orbiter system test in one of the Orbiter Processing Facility bays without requiring the presence of an engineer in the LCC control room, as is the case with the LPS.

- Program-compatible data. CLCS will incorporate data formats and protocols compatible with other NASA centers, making it easier for different centers to share data and more easily compare information.

The CLCS concept emphasizes the universal rather than the specialized. With the LPS, specific firing room consoles are assigned to specific Shuttle or ground support systems.

The CLCS will feature generically-configured consoles which can handle checkout and



JOHN Porter (sitting) and Greg Clements of NASA work on the second prototype console in the LCC-X. This configuration features such state-of-the-art elements as a flat-panel monitor (center), videoconferencing capability and incorporation of Operational Television (OTV) as an insert window within the monitor display. The other prototype offers the capability for a laptop computer plug-in, Internet access and an electronic logbook. CLCS personnel will conduct demonstrations of the two prototypes and allow the user community to sit down and experiment with them at length.

test of any system, unlike the system-specific LPS consoles.

### User Community Role

The user community has been involved with CLCS development since the beginning. "We are very customer-oriented," noted Hart.

Acting as fulltime liaisons for the user community are Jeff Wheeler, NASA, and Chris Best, USA. Wheeler and Best regularly involve representatives from virtually every directorate at KSC, from payloads to Shuttle operations, including the NASA Test Director (NTD) world, that interact with the current system.

"We are constantly trying to involve the user in the process so that when we reach the end product we have something that the user is comfortable with," Wheeler said.

"One of the biggest challenges in this effort is the software re-engineering," Wheeler observed. "There's going to be a lot of user involvement in that design work."

He pointed out some of the other issues which must be resolved: Preserving "legacy" systems, which refers to systems such as the Operational Television (OTV) network and Operational Intercom System (OIS) that predate CLCS and are being retained; identifying what it takes to maintain a console configuration once it is established; and determining how to actually work with CLCS once it is in place. For example, CLCS will provide much greater capability for work to be performed in the field.

### New Architecture, New Look

CLCS will provide the same functionality as the current LPS, but with a new architecture. This distributed architec-

ture, based on commercial off-the-shelf technology and industry-standard hardware and software, will provide flexibility and automation enabling significant reduction in Shuttle operations costs.

CLCS will produce a fresh new look for the control rooms. Virtually all aspects of the control room consoles will be replaced, from the computers to the display monitors and keyboards to the shells in which they are encased.

The very configuration of the firing room is up for discussion and could end up completely different from the present layout.

No changes will be made on the vehicle side of CLCS — the interface between Shuttle hardware/software elements and the new processing system. This was one of the ground rules established by the CLCS project personnel.

One of the biggest challenges KSC faces in upgrading the LPS is maintaining the manifest while transitioning from the old to the new, said Tom Fleming, a member of the CLCS project controls staff.

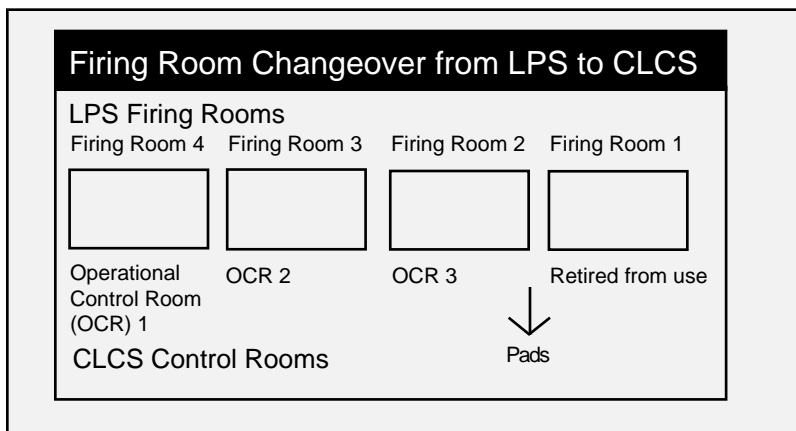
To achieve this without imposing delays, the new processing system will begin installation in firing room 4 and then move through firing rooms 3 and 2.

The rooms will be renumbered under CLCS, with LPS firing room 4 becoming CLCS Operational Control Room 1 (OCR 1). A conference room located next to firing room 4 will become part of OCR 1.

When firing room 2 has been converted into OCR 3, the system will be at full capability. LPS Firing Room 1 will be retired from operational use.

### Delivery Schedule

Implementation of CLCS also incorporates an innovative philosophy. Rather than delivering



a final product by a certain date, the new launch system will be brought online in six-month increments for the next five years.

"Each delivery provides a new capability," Hart said. It can be actual equipment or simply modifications to a facility to prepare it for CLCS. The most critical deliveries will be of software elements that provide a new or improved capability.

Only four months into the project, CLCS enjoyed an early success in supporting the ice team on STS-81 and STS-82 with prototype consolidated data.

The team captured pad weather data off a separate network; performed ice build-up calculations; merged the weather data with the existing data stream; and provided new displays to the ice team in the firing room.

Hart stated, "This is indicative of the way we will deliver the system: Build a little, test a little, deliver a little, until the entire system is complete. This ensures that CLCS becomes a reality instead of existing only on paper."

The milestones are named individually after historic launch vehicles, with the first one called Juno. Juno will mark the establishment of an experimental control room March 28 in the Firing Room 2 "bubble" room featuring two different prototype consoles for the user community to experiment with.

As Jeff Wheeler noted, this first delivery exemplifies how attuned the CLCS effort is to the

user community, allowing a firsthand look at the equipment and the opportunity to sit down and experiment with it and then provide feedback to the CLCS team.

Because the new system is being implemented on a tight schedule committed to deliveries every six months, a smooth procurement process is critical to the success of the effort. Fleming cited the "remarkable job" done by personnel in the Procurement world to expedite the schedule.

### Completion

The CLCS system is scheduled to be fully operational by September 2001.

First operational use will occur in March 1999 at the Hypergol Maintenance Facility (HMF) in the KSC Industrial Area, and the first CLCS-supported orbiter flow will begin in August 2000.

Both Hart and Fleming emphasized that the CLCS project represents a challenging opportunity for interested NASA and contractor personnel.

The CLCS team is still recruiting members motivated by the prospect of bringing the KSC checkout and launch processing system into the next century.

"It is important that the Space Shuttle launch team have the tools needed to execute safe and successful launches," said Shuttle Operations Director Robert Sieck. "With this new tool, the CLCS, our team will be able to maintain its reputation as the 'greatest launch team in the universe' well into the 21st century."

**CLCS Web Site: <http://lpsweb.ksc.nasa.gov/CLCS/>**



## MSL-1 . . .

(Continued from Page 1)

Space Station hardware will be loaded into a new type of rack from the front, and the connections will be made from the front.

The new rack system, flying for the first time on this mission, is known as the Expedite the Processing of Experiments to Space Station (EXPRESS) Rack. It will take the place of a standard Spacelab double experiment rack. The EXPRESS rack and the prelaunch processing procedures for it are expected to significantly reduce the amount of time required for getting experiments into space.

In addition to conducting in-

vestigations for the International Space Station program, experiments aboard the MSL-1 Spacelab module will continue NASA's microgravity research efforts to provide advances in the fields of materials science, protein crystal growth and physics.

### Spacelab Experiments

- **Protein Crystal Growth** — Since proteins are essential elements of all living cells, the goal of NASA's microgravity program is to further research in this area by producing protein crystals that are near-perfect and larger than those that can be grown on Earth.

Such crystals are easier to analyze to determine just how they perform specific functions



OUTSIDE the orbiter hatch at Launch Pad 39A during the Terminal Countdown Demonstration Test (TCDT) are (from left) STS-83 Payload Specialist Gregory Linteris; Pilot Susan Still; Mission Commander James Halsell; Mission Specialist Michael Gernhardt; Payload Commander Janice Voss; Payload Specialist Roger Crouch; and Mission Specialist Don Thomas.

in the human body and plants.

Three protein crystal growth experiments will fly on MSL-1.

- **Combustion Experiments** — Although combustion plays a key role in our lives and has been researched for more than a century, many of the fundamental combustion processes are still little understood.

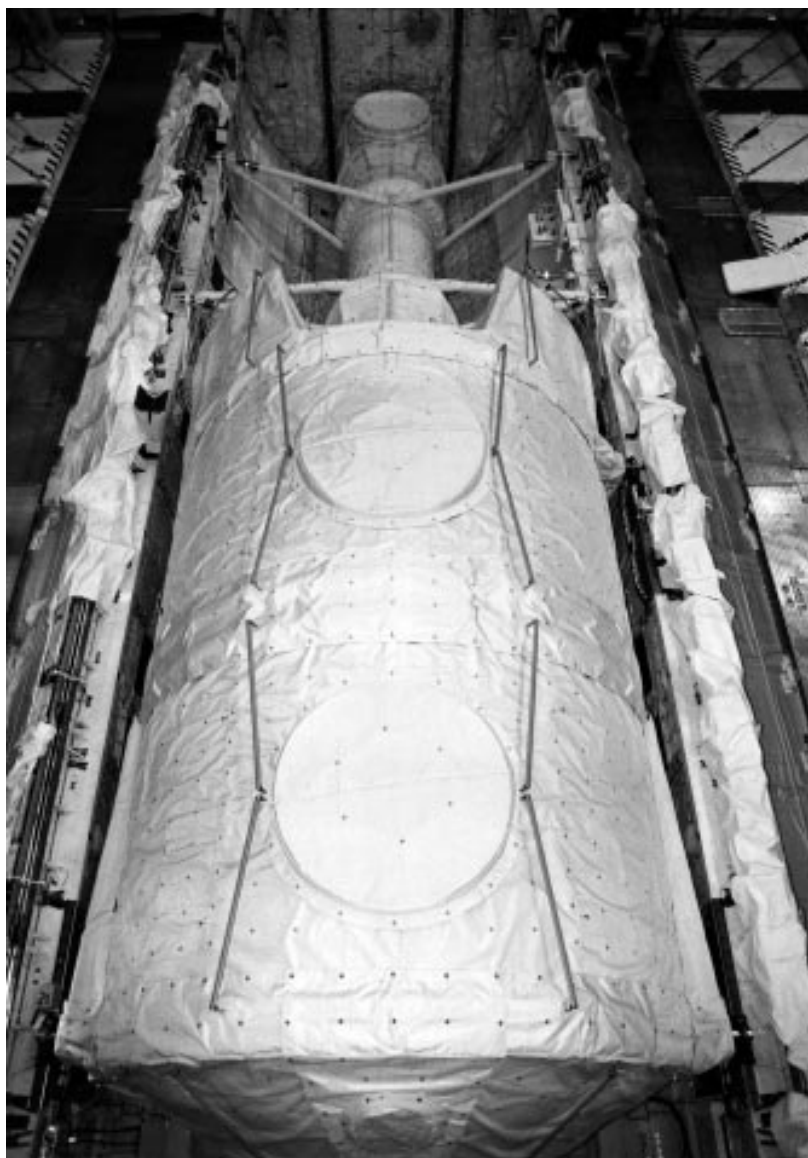
Two MSL-1 combustion experiments will be conducted in the Combustion Module-1 (CM-1) This unit requires two Spacelab racks and houses a

combustion chamber and seven cameras, as well as the experiment package.

- **Materials Science** — During the MSL-1 mission, 19 materials science experiments will be conducted in four facilities.

The experiments will investigate the materials in solid and fluid form, since materials often change from solids to fluids and back again during manufacturing processes.

Landing at KSC is scheduled to occur at 7:37 a.m., April 19.



MSL-1 Spacelab module and long tunnel in the payload bay of the orbiter Columbia in the Orbiter Processing Facility.



John F. Kennedy Space Center

## Spaceport News

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